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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample and a personnel evaluation form are also included. (AG)

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June 1970

U.S. Training and
Employment Service
Technical Report
S-171R

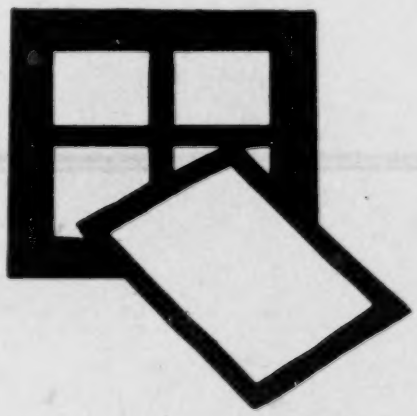
Development of USTES

APTITUDE TEST BATTERY FOR

GLAZIER

(const)
865.781

U.S DEPARTMENT OF LABOR
Manpower Administration



Technical Report on Development of USTES Aptitude Test Battery

For . . . .

Glazier (const.) 865.781

S-171R

(Developed in Cooperation with the
Wisconsin State Employment Service)

U.S. Department of Labor
Manpower Administration

June 1970

FOREWORD

The United States Training and Employment Service General Aptitude Test Battery (GATB) was first published in 1947. Since that time the GATB has been included in a continuing program of research to validate the tests against success in many different occupations. Because of its extensive research base the GATB has come to be recognized as the best validated multiple aptitude test battery in existence for use in vocational guidance.

The GATB consists of 12 tests which measure 9 aptitudes: General Learning Ability, Verbal Aptitude, Numerical Aptitude, Spatial Aptitude, Form Perception, Clerical Perception, Motor Coordination, Finger Dexterity, and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, with a standard deviation of 20.

Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, in combination predict job performance. For any given occupation, cutting scores are set only for those aptitudes which contribute to the prediction of performance of the job duties of the experimental sample. It is important to recognize that another job might have the same job title but the job content might not be similar. The GATB norms described in this report are appropriate for use only for jobs with content similar to that shown in the job description included in this report.

GATB Study # 2268

Development of USTES Aptitude Test Battery

For

Glazier (const.) 865.781-010

S-171R

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupation of Glazier (const.) 865.781-010. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB Scores
N-Numerical Aptitude	80
S-Spatial Aptitude	105
P-Form Perception	75

Research Summary

Sample:

55 male workers employed as Glaziers in Wisconsin.

This study was conducted prior to the requirement of providing minority group information. Therefore, minority group status is unknown.

Criterion:

Supervisory ratings.

Design:

Concurrent (test and criterion data were collected at approximately the same time).

Minimum aptitude requirements were determined on the basis of a job analysis and statistical analyses of aptitude mean scores, aptitude-criterion correlations and selective efficiencies.

Concurrent Validity:

Phi Coefficient = .32 ($P/2 < .01$)

Effectiveness of Norms:

Only 64% of the nontest-selected workers used for this study were good workers; if the workers had been test-selected with the above norms, 78% would have been good workers. Thirty-six percent of the nontest-selected workers used for this study were poor workers; if the workers had been test-selected with the above norms, only 22% would have been poor workers. The effectiveness of the norms is shown graphically in Table 1:

TABLE 1

Effectiveness of Norms

	Without Tests	With Tests
Good Workers	64%	78%
Poor Workers	36%	22%

SAMPLE DESCRIPTION

Size:

N = 55

Occupational Status:

Employed Workers.

Work Setting:

Workers were employed by the following companies in various cities in Wisconsin.

Name of Company	City
T.C. Esser Company	Milwaukee
Thomas Glass Company	Milwaukee
Pittsburgh Plate Glass Company	Milwaukee
Milwaukee Plate Glass Company	Milwaukee
Hoffer Glass Corporation	Milwaukee
Lurie Glass Company	Milwaukee
Pittsburgh Plate Glass Company	Wausau
Hoffer Glass Company	Wausau
Patek Brothers, Incorporated	Milwaukee
Pittsburgh Plate Glass Company	Oshkosh
T. C. Esser Company	Oshkosh
Hoffer Glass Company	Green Bay
Pittsburgh Plate Glass Company	Green Bay
Hoffer Glass Company	Appleton
T. C. Esser Company	Sheboygan
Sheboygan Glass Company	Sheboygan

All the men in the sample were members of Glazier's Union Local #1204

Employer Selection Requirements:

Education: An eighth grade education is preferred.

Previous Experience: None required.

Tests: None used.

Other: Personal interview and reference check.

Principal Activities:

The job duties for each worker are comparable to those shown in the job description in the Appendix.

Minimum Experience:

All workers in the final sample had at least two years job experience. (The formal apprenticeship training program is four years. Basic training is completed by the end of the second year.)

TABLE 2

Means, Standard Deviations (SD), Ranges and Pearson Product-Moment Correlations with the Criterion (r) for Age, Education and Experience. N =55

	Mean	SD	Range	r
Age (years)	35.7	6.9	24-55	-.007
Education (years)	10.5	1.6	6-12	.102
Experience (months)	123.7	63.2	24-378	.176

EXPERIMENTAL TEST BATTERY

All 12 tests of the GATB, B-1002A were administered during the period January 1959 to April 1959.

CRITERION

The criterion data consisted of supervisory ratings of job proficiency made at approximately the same time as the tests were administered with a time interval of four or five weeks between the two ratings. The plant superintendent, manager, or president rated each worker.

Rating Scale:

Form SP-21 "Descriptive Rating Scale" was used. The scale (see Appendix) consists of nine items covering different aspects of job performance. Each item has five alternative responses corresponding to different degrees of job proficiency.

Reliability:

A reliability coefficient of .94 was obtained between the initial ratings and the re-ratings, indicating a significant relationship. The final criterion score consists of the combined scores of the two ratings.

Criterion Score Distribution:

Possible Range:	18-90
Actual Range:	38-90
Mean:	65.2
Standard Deviation:	12.8

Criterion Dichotomy:

The criterion distribution was dichotomized into low and high groups by placing 36% of the sample in the low group to correspond with the percentage of workers considered unsatisfactory or marginal. Workers in the high criterion group were designated as "good workers" and those in the low group as "poor workers." The criterion critical score is 58.

APTITUDES CONSIDERED FOR INCLUSION IN THE NORMS

Aptitudes were selected for tryout in the norms on the basis of a qualitative analysis of job duties involved and a statistical analysis of test and criterion data. Aptitudes P and M which do not have high correlations with the criterion were considered for inclusion in the norms because the qualitative analyses indicated that the aptitudes might be important for the job duties and the sample had a relatively high mean score for Aptitude M and a relatively low standard deviation for Aptitude P. Aptitude N was considered for inclusion in the trial norms because Aptitude G, which qualified for consideration, was eliminated from consideration in this reanalysis in order to minimize the verbal requirement of the battery. In the composition of Aptitude G, arithmetic reasoning has the highest factor loading. Tables 3, 4, and 5 show the results of the qualitative and statistical analyses.

TABLE 3

Qualitative Analysis
(Based on the job analysis, the aptitudes indicated appear to be important to the work performance)

Aptitudes	Rationale
G - General Learning Ability	Required to interpret blueprints, sketches and oral instructions and to use judgment in determining procedures for each job.
S - Spatial Aptitude	Required to interpret blueprints, to plan installations, and to visualize finished product.
P - Form Perception	Required to measure and cut glass to specified size and shape and to measure door openings to be fitted; to inspect glass for defects or any improper finishing.
F - Finger Dexterity	Required to feel glass into cutting machine and install glass, skylights and partitions.
M - Manual Dexterity	Required to handle the necessary tools and hardware attachments to install glass, skylights, partitions, etc.

On the basis of job analysis data, Aptitude V was considered obviously unimportant for performing the duties of this job and was therefore considered an "irrelevant" aptitude.

TABLE 4

Means, Standard Deviations (SD), Ranges and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB; N =55

Aptitudes	Mean	SD	Range	r
G - General Learning Ability	106.7	13.7	70-136	.233
V - Verbal Aptitude	100.3	14.0	70-129	.135
N - Numerical Aptitude	102.7	13.5	67-133	.088
S - Spatial Aptitude	110.6	15.7	78-156	.368**
P - Form Perception	99.3	13.3	68-134	.197
Q - Clerical Perception	99.6	13.9	77-133	.198
K - Motor Coordination	99.0	16.8	60-138	-.043
F - Finger Dexterity	92.4	17.0	54-147	-.114
M - Manual Dexterity	104.2	16.7	69-140	-.076

**Significant at the .01 level

TABLE 5

Summary of Qualitative and Quantitative Data

Type of Evidence	Aptitudes								
	G	V	N	S	P	Q	K	F	M
Job Analysis Data									
Important	X			X	X			X	X
Irrelevant		X							
Relatively High Mean	X			X					X
Relatively Low Standard Dev.	X		X		X	X			
Significant Correlation with Criterion				X					
Aptitudes to be Considered for Trial Norms			N	S	P				M

DERIVATION AND VALIDITY OF NORMS

Final norms were derived on the basis of the degree to which trial norms consisting of various combinations of aptitudes N, S, P and M at trial cutting scores were able to differentiate between the 64% of the sample considered to be good workers and the 36% of the sample considered to be poor workers. Trial cutting scores at five-point intervals approximately one standard deviation below the mean are tried because this will eliminate about one-third of the sample with three-aptitude norms. For four-aptitude trial norms, cutting scores of slightly less than one standard deviation below the mean will eliminate about one-third of the sample; for two-aptitude trial norms, minimum cutting scores of slightly more than one standard deviation below the mean will eliminate about one-third of the sample. The Phi Coefficient was used as a basis for comparing trial norms. Norms of N-80, S-105 and P-75 provided optimum differentiation for the occupation of Glazier (const.) 865.781-010. The validity of these norms is shown in Table 6 and is indicated bya Phi Coefficient of .32 (statistically significant at the .01 level).

TABLE 6

Concurrent Validity of Test Norms
N-80, S-105 and P-75

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	10	25	35
Poor Workers	13	7	20
Total	23	32	55

Phi Coefficient = .32 Chi Square (X^2_y) = 5.5

Significance Level = $P/2 < .01$

DETERMINATION OF OCCUPATIONAL APTITUDE PATTERN

The data for this study met the requirements for incorporating the occupation studied into OAP-34 which is shown in the 1970 edition of Section II of the Manual for the General Aptitude Test Battery. A Phi Coefficient of .24 is obtained with the OAP-34 norms of N-90, S-95, P-90.

SP-21
Rev. 2/61

A-P-P-E-N-D-I-X

DESCRIPTIVE RATING SCALE
(For Aptitude Test Development Studies)

Score____

RATING SCALE FOR _____
D. O. T. Title and Code

Directions: Please read Form SP-20, "Suggestions to Raters", and then fill in the items listed below. In making your ratings, only one box should be checked for each question.

Name of Worker (print) _____
(Last) (First)

Sex: Male_____ Female_____

Company Job Title: _____

How often do you see this worker in a work situation?

☐ See him at work all the time.

☐ See him at work several times a day.

☐ See him at work several times a week.

☐ Seldom see him in work situation.

How long have you worked with him?

☐ Under one month.

☐ One to two months.

☐ Three to five months.

☐ Six months or more.

A. How much work can he get done? (Worker's <u>ability</u> to make efficient use of his time and to work at high speed.)

☐ 1. Capable of very low work output. Can perform only at an unsatisfactory pace.

☐ 2. Capable of low work output. Can perform at a slow pace.

☐ 3. Capable of fair work output. Can perform at an acceptable but not a fast pace.

☐ 4. Capable of high work output. Can perform at a fast pace.

☐ 5. Capable of very high work output. Can perform at an unusually fast pace.

B. How good is the quality of his work? (Worker's ability to do high-grade work which meets quality standards.)

☐ 1. Performance is inferior and almost never meets minimum quality standards.

☐ 2. The grade of his work could stand improvement. Performance is usually acceptable but somewhat inferior in quality.

☐ 3. Performance is acceptable but usually not superior in quality.

☐ 4. Performance is usually superior in quality.

☐ 5. Performance is almost always of the highest quality.

C. How accurate is he in his work? (Worker's ability to avoid making mistakes.)

☐ 1. Makes very many mistakes. Work needs constant checking.

☐ 2. Makes frequent mistakes. Work needs more checking than is desirable.

☐ 3. Makes mistakes occasionally. Work needs only normal checking.

☐ 4. Makes few mistakes. Work seldom needs checking.

☐ 5. Rarely makes a mistake. Work almost never needs checking.

D. How much does he know about his job? (Worker's understanding of the principles, equipment, materials and methods that have to do directly or indirectly with his work.)

☐ 1. Has very limited knowledge. Does not know enough to do his job adequately.

☐ 2. Has little knowledge. Knows enough to "get by."

☐ 3. Has moderate amount of knowledge. Knows enough to do fair work.

☐ 4. Has broad knowledge. Knows enough to do good work.

☐ 5. Has complete knowledge. Knows his job thoroughly.

E. How much aptitude or facility does he have for this kind of work? (Worker's adeptness or knack for performing his job easily and well.)

☐ 1. Has great difficulty doing his job. Not at all suited to this kind of work.

☐ 2. Usually has some difficulty doing his job. Not too well suited to this kind of work.

☐ 3. Does his job without too much difficulty. Fairly well suited to this kind of work.

☐ 4. Usually does his job without difficulty. Well suited to this kind of work.

☐ 5. Does his job with great ease. Exceptionally well suited for this kind of work.

F. How large a variety of job duties can he perform efficiently? (Worker's ability to handle several different operations in his work.)

☐ 1. Cannot perform different operations adequately.

☐ 2. Can perform a limited number of different operations efficiently.

☐ 3. Can perform several different operations with reasonable efficiency.

☐ 4. Can perform many different operations efficiently.

☐ 5. Can perform an unusually large variety of different operations efficiently.

G. How resourceful is he when something different comes up or something out of the ordinary occurs? (Worker's ability to apply what he already knows to a new situation.)

☐ 1. Almost never is able to figure out what to do. Needs help on even minor problems.

☐ 2. Often has difficulty handling new situations. Needs help on all but simple problems.

☐ 3. Sometimes knows what to do, sometimes doesn't. Can deal with problems that are not too complex.

☐ 4. Usually able to handle new situations. Needs help on only complex problems.

☐ 5. Practically always figures out what to do himself. Rarely needs help, even on complex problems.

H. How many practical suggestions does he make for doing things in better ways? (Worker's ability to improve work methods.)

☐ 1. Sticks strictly with the routine. Contributes nothing in the way of practical suggestions.

☐ 2. Slow to see new ways to improve methods. Contributes few practical suggestions.

☐ 3. Neither quick nor slow to see new ways to improve methods. Contributes some practical suggestions.

☐ 4. Quick to see new ways to improve methods. Contributes more than his share of practical suggestions.

☐ 5. Extremely alert to see new ways to improve methods. Contributes an unusually large number of practical suggestions.

I. Considering all the factors already rated, and <u>only</u> these factors, how acceptable is his work? (Worker's "all-around" ability to do his job.)

☐ 1. Would be better off without him. Performance usually not acceptable.

☐ 2. Of limited value to the organization. Performance somewhat inferior.

☐ 3. A fairly proficient worker. Performance generally acceptable.

☐ 4. A valuable worker. Performance usually superior.

☐ 5. An unusually competent worker. Performance almost always top notch.

June 1970

S-171 R

FACT SHEET

Job Title: Glazier (const.), 865.781-010

Job Summary: Sets various types of glass in such openings as windows, skylights, store fronts, and showcases or on flat surfaces such as building fronts, interior walls, and ceilings.

Work Performed: Prepares to install glass: Studies blueprints, sketches or oral instructions and determines type and size of pane or light of glass and molding to be used; measures precut glass for specified size, and if necessary, trims it to proper size by placing a straightedge on glass, drawing glass cutter firmly along straightedge, placing the cut glass over a flat surface with all glass outside of cut protruding from the surface, and tapping it gently with the handle of glass cutter to completely sever it; if edge of glass is jagged after being severed, the rough edges are broken off with square nosed pliers. Notches or cuts into plate glass and mirrors by feeding glass on table into cutting wheel of Glass Cutting Machine until desired cut has been made. Removes sharp edges on plate glass or mirrors by sanding edges with Portable Belt Sander or by holding glass in hands and manipulating edges along surface of Stationary Belt Sander. Grinds and polishes edges of plate glass and mirrors to smooth rounded finish by holding glass in hands and manipulating edges in grooves of power Grinding and Polishing Wheels. Erects scaffolding if specifications require installing glass at high levels: cleans groove in which glass is installed by hammering, brushing or scraping sash, molding, or framework to remove any adhering plaster, cement, or any other extraneous material.

Installs window glass in wood or metal sash: Fills groove in sash with putty, using fingers to lay it in groove and putty knife to smooth it, and presses pane into the putty; inserts glaziers' points in wood sash or glazing clips in metal sash, at intervals between glass and frame to hold glass rigidly; spreads putty around pane forming a bevel at edge of sash or may attach a strip of metal or wood molding around sash to seal the glass against air or water or to provide a means of decoration.

Installs puttyless skylights: Lays mastic felt strips on framework and places glass on strips; inserts glazing clips in framework to hold glass firmly; places another layer of felt strips and metal molding around edge of glass, securing metal molding and both layers of felt strips to framework with bolts.

Installs structural glass or mirror panels on walls, ceilings, or building fronts: Provides support for panels either by laying a strip of resilient material on floor or sidewalk or by bolting small metal blocks to wall when glass or mirror is installed above floor level; spreads special adhesive material, such as mastic cement, on rear of glass or mirror and a coat of bond to backing surface, and presses glass or mirror on wall or ceiling; further secures glass or mirror to walls and ceiling by inserting decorative screws in predrilled holes in panels; applies strip of adhesive cork tape to horizontal edges of structural glass panels before installing

adjoining glass panels to form a cushion between panels and fills all joints or openings between glass panels with joint cement; attaches metal molding around outer edges of structural glass after all panels have been installed.

Installs plate glass windows: Screws grooved metal molding, or angle irons, to window frame; inserts felt, leather, or wooden blocks along bottom edge of molding or angle irons, to allow for expansion and contraction of glass or molding and places glass (with the assistance of others) in groove of molding or angle iron; if installing a window consisting of more than one side, attaches vertical moldings at corners where plate glass panes connect; attaches metal face molding around edge of window by bolting it to molding or angle iron.

Installs sliding glass partitions in rooms or showcases: Presses metal shoe channel on top and bottom edges of glass; screws U-shaped metal roller track in floor or bottom of case and T-shaped metal roller track in ceiling or top of case and places glass in track groove; may drill holes in glass for hardware by boring hole with a file mounted in a brace or drill; may install hardware attachments, such as push and pull bars, by inserting fiber or rubber plugs in drilled holes and bolting hardware to plug.

Installs sheets of structural glass to form decorative building fronts, glass blackboards for schools, walls or ceilings by fitting and installing metal or wood framework, frames and moldings, and using mastic cement, decorative screws, anchors and metal strips to fasten glass in place.

Fits and installs heavy plate glass doors. Measures door opening to be fitted. Attaches hardware such as metal hinges, handles and locks to doors by drilling holes in glass with File mounted in Brace and Bit, and bolting hardware to glass. Sets door in doorframe and positions metal frame hinges. Fits hinges on door to hinges on frame and thereby positions door in door frame opening.

Effectiveness of Norms:

Only 64% of the non-test-selected workers used for this study were good workers; if the workers had been test-selected with the S-171R norms 78% would have been good workers. 36% of the non-test-selected workers used for this study were poor workers; if the workers had been test-selected with the S-171R norms, only 22% would have been poor workers.

Applicability of S-171R Norms:

The aptitude test battery is applicable to jobs which include a majority of duties described above.

GPO 898.812

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